FINERO *The Quality Control Company*

User Manual

FST-200 4 S Analyzer

Generalvertretung Deutschland:

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ANNEX A - FST-200 4 S ANALYZER - COMMAND LIST

Dear Customer,

Thank you for purchasing Finero test and measurement equipment. Finero is obliged to provide you with the best on the market available test and measurement equipment. The 30 years of Finero experience in most demanding production applications are made available to you in this piece of equipment.

We are confident that this equipment will support your endeavors to keep up the good quality of your production.

If you have any comments about Finero products, software or services I would like to hear of them.

Yours truly,

Risto Vuolle
Chief Executive Officer

Finero Inc.
Kausala, Finland

All information is subject to changes without prior notice.

DELIVERY SCOPE LIST

Although Finero packages the equipment with utmost care you should check the package regarding any delivery damages. If the equipment is damaged you should contact your insurance company directly and inform Finero as well about the matter. Please include photos if possible.

The package should include in minimum following documents and materials:

FST-200	1pc
Mains cable	1pc
User Manual	1pc
Calibration Certificate	1pc
HV test lead, red	4pcs

1 TECHNICAL INFORMATION

Type:	FST-200 4 S Analyzer
Serial number:	See back of device
Size:	483x148x410 (width, height, depth) Designed to 19"-eurorack, height 3U 133mm, without legs
Weight:	23 kg
Operation voltage:	230VAC (±10%) 50Hz/60Hz single phase
Operation power:	360VA
Connection:	Cable plug, equipment earth
Main fuses:	2,5A slow 5x20mm glass
Environment temperature:	+5°C...+35°C
Environment conditions:	Dry and clean

PE Protective Continuity Test

Output:	Max 12Vac, 50Hz/60Hz
Output current:	2 ranges, 10A and 25A, setting accuracy -0+20%
Accuracy	Resistance +-0,5% from the range +5 digits Current +-0,5% from the range +5 digits
Measuring range:	0...500mOhm
Timer function:	OFF or 0,3...60s with 0,1s steps

ISO Insulation Resistance Test

Output:	100...500Vdc, freely programmable
Maximum test current:	3,0mA, current limited, short circuit proof
Accuracy	Better than +-1% from the range, (if resistance <10% of the range)
Measuring ranges:	Autorange, 0,5...10MΩ; 5...100MΩ; 50...1000MΩ; 0,5...10GΩ
Timer function:	OFF or 0,3...60s with 0,1s steps
Ramp function:	Time controlled 0...10s, in front of the test cycle

HV High Voltage Test

Output:	0V...5000V ac voltage 50Hz DC option available
Maximum test current:	10mA
Maximum test apparent power:	50VA
Measurements:	True RMS for I and U
Accuracy:	+-0,5% from the range +5 digits
Measurement ranges:	2mA/10mA
Timer function:	OFF or 0,3…60s with 0,1s steps
Ramp function:	Ramp up and/or down 5…30s
Partial discharge detector:	OFF or relative sensitivity adjustable 1...100

RES Resistance measuring

Output voltage:	Max 50V ac voltage 50Hz
Test current:	Max 200mA
Measuring ranges:	Autorange, 0…2Ω; 0…10Ω; 0…100Ω; 0…500Ω
Accuracy:	+-0,5% from the range +5 digits
Timer function:	OFF or 0,3…60s with 0,1s steps

Connections:

Ground and PE-measuring:	Back panel 4mm laboratory sockets (2pc safety and 2pc normal). PE-measurement is done with 4-wire.
ISO, HV and RES-measuring:	Back panel 4mm high voltage sockets. RES-measuring is done with 4-wire.
Remote control :	Start, stop, test, fail and safety circuit 24VDC D25-female -connector in back panel
Computer connection (option):	LAN, USB(B), GPIB or RS-232 connector in the back panel
RS485 Interface	To be used for device to device communication between FST-line equipment

2 GENERAL

2.1 FST-200

The FST-200 4 S Analyzer comprises of HiPot, Isolation Resistance, Protective Earth (PE) resistance and the Device Under Test (D.U.T.) functional resistance measurement up to 500mOhms.

FST-200 is delivered standard either with GPIB (5770) or with RSR232 (5772) interface. Other interfaces are available as options.

ANY UNAUTHORIZED OPEING OF THE EQUIPMENT WILL VOID THE WARRANTY.

2.2 FST-200 control modes

The FST-200 can be controlled either locally by means of the front panel buttons, indicators and analogue meter or in automatic test systems by a computer. Other remote control possibilities exist by using the D25 connector in the back panel.

2.3 Calibration

The FST-200 is factory tested and calibrated to meet the accuracy requirements. We recommend to calibrate FST-200 regularly once a year. The equipment may be calibrated in our factory or by other means agreed separately. In the back of the equipment is a replaceable measurement module, which can be sent to calibration.

3 SAFETY PRECAUTIONS

3.1 General

The operator should study carefully the instruction manuals and operation of the FST-200 as well as testing instructions for the product to be tested before starting any tests. As a further safety precaution the operator should be aware of emergency first aid actions. The FST-200 shall only be used strictly according to this user manual. All modifications are not allowed.

3.2 High Voltage and High Current WARNING

The high voltage connectors in rear panel have a dangerous high voltage during the test.

The current supplied by the FST-200 is high enough to cause convulsion and potentially to get trapped to the parts under high voltage. The FST-200 measures the current in the circuit and shall switch the voltage off if the current exceeds the set current limit, THIS FEATURE CANNOT BE USED AS A SAFETY MEASURE!

NEVER TOUCH THE HIGH VOLTAGE CONNECTORS OR TEST LEADS IF THE FST-200 IS SWITCHED ON!

The rear panel test connectors have low voltage during the test but due to high current there may occur some sparking in the test connectors. Also care must be taken of heating of the test leads caused by high currents. Therefore use sufficient cable cross section size for test leads. They can be ordered also as an option from Finero.

The FST-200 measures the current in the circuit and shall switch the voltage off if the current exceeds the set current limit, THIS FEATURE CANNOT BE USED AS A SAFETY MEASURE!

NEVER TOUCH THE CONNECTORS OR TEST LEADS IF THE FST-200 IS SWITCHED ON!

4 INSTALLATION

4.1 General

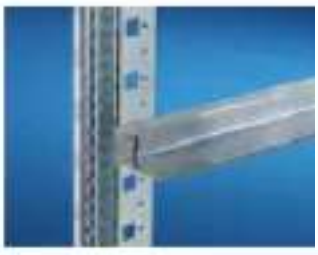
FST-200's depth is about 370mm and connectors need about 150mm space from rear. The handles mounted on the front panel are elevated about 40mm from the panel. The FST-200 is not allowed to be carried from the front panel handles. For carrying FST-200 the handles on the side of the equipment should be used.

The FST-200 can be used in its own case only in dry and clean environment. The ventilation, however, should not be prevented.

4.2 Mounting into 19" Module –Rack or Case

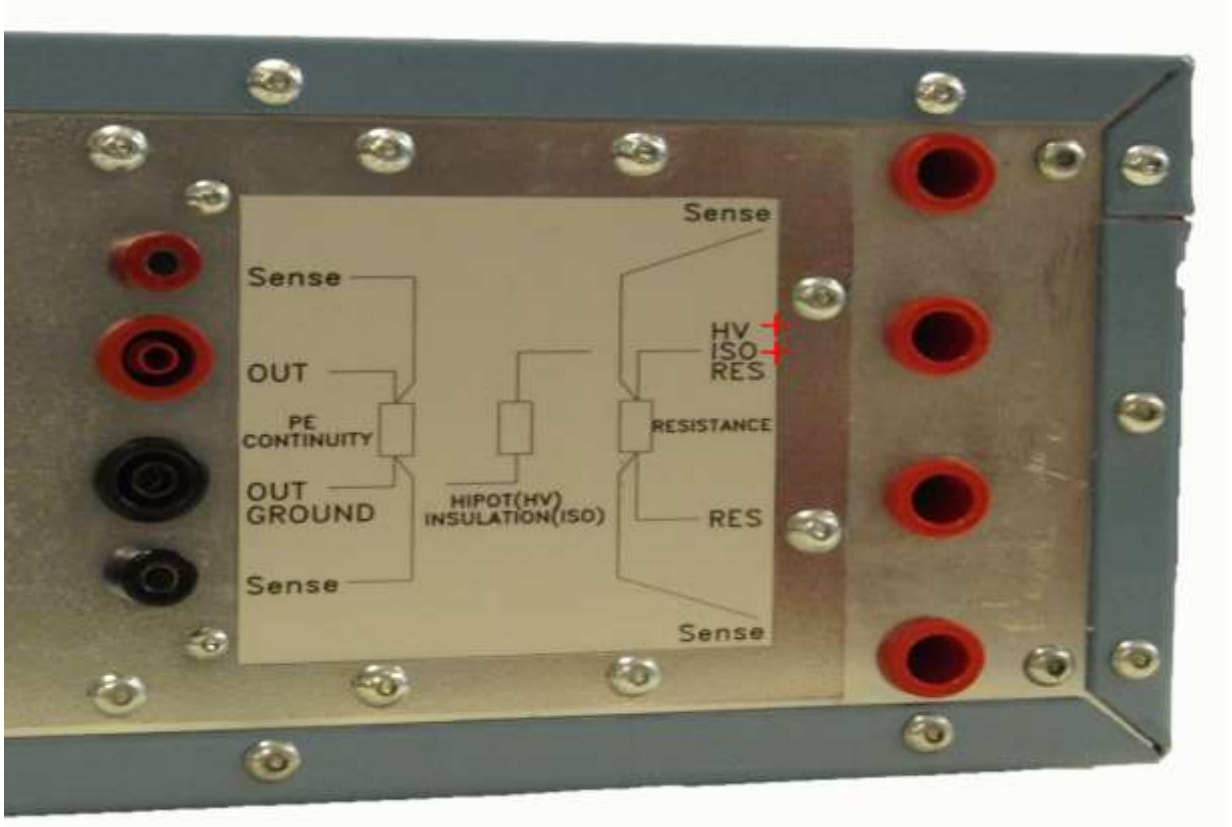
When installed into a rack or a similar case it is mandatory to use mounting rails due to the weight of the device. The holes in the front panel are intended for locking the device in its place not for backing the whole device. If there are legs below of FST-200, they must take off before installation to 19" rack. Care must be taken of the air circulation in the rack in order to avoid temperature rise above +35 °C.

Here are some examples of how build the support for rack installation.



4.3 Connecting to the D.U.T.

The connections to the D.U.T. are made according to the below figure.



It is possible to use only 2 wires in PE continuity measurement by compromising on measurement accuracy. So Finero recommends to use only 4-wire measurement method.

4.5 Mains supply and Switching On the FST-200

Connect the FST-200 to the mains supply in following order:

- Check that the position of the front panel POWER switch is 0.

- Connect the control and high voltage cables to the FST-200.
- Plug the mains cord to the FST-200.
- Plug the mains cord to a mains outlet
- Switch ON the FST-200

5 MANUAL OPERATION

5.1 General

The manual operation means the use of the FST-200 by the front panel buttons, indicators and display panel. At the end of the manual there is a list of malfunctions with possible causes. Caution, there are high voltage in connectors behind FST-200 while test is ON.

5.2 Buttons and indicators

The picture below shows the FTS-line switches and indicator lights and the table below explains their functions.

Button	**Used for…**
SELECT fly wheel knob	Turn to browse between parameters or select parameter value
ENTER button	Used to confirm
TEST indication	Indicates the TEST is running
START button	Start the test sequence
STOP button	Stop the test
FAIL indication	Indicates failed test (not passed) and loud buzzer noise will go off simultaneously

5.3 Start-Up

Power is switched on by the "Power" –switch (see 4.5). After switching the unit on calibration information is shown for a few seconds in the panel display.

→ FST-200 set values -- Ready-display

5.4 Setting Parameters

The unit has a set value memory, last time saved values are stored in flash memory (no power needed).

Setting paremeter with FST-line equipment is very easy.

After the READY display, like above please follow the instructions as below.

Setting Parameters with FST

Action	Result	Display
press ENTER for a few seconds in READY display mode	Parameter setting display	
Turn Flywheel knob to the desired parameter position and press ENTER	Ready to set parameter	
Turn flywheel knob in order to set the desired parameter value	Parameter value selected	
Press ENTER	Set parameter value confirmed	
Move cursor with flywheel knob to the EXIT and press ENTER	Exiting from parameter setting mode	

5.5 Preparation for Service Call

To check program version (for service only):

press “Enter” –button when calibration information is shown.

All software version and printed circuit board versions can be seen on the display. This is important information before you contact Finero Service.

5.6 Control menu and commands

During the measurement the measured values as well as after test the last measured values are shown on front panel display.

Menu commands – **General Settings**

Parameter	Function and setting range
PE	PE-Continuity Test parameters
ISO	Insulation Resistance Test parameters
HV	High Voltage Test parameters
RES	Resistance Measurement parameters
System	Self test and Calibration date adjustment
Timer	Test time clock (OFF or 0,1s…60s)

Menu commands – **PE Protective Earth Continuity measurement**

Parameter	Function and setting range
I-set	Test current (10A or 25A)
R-min	Resistance low limit value (0mΩ… high limit value)
R-max	Resistance high limit value (low limit value…500mΩ)

Timer	Test time clock (OFF or 0,3s…60s)
Save	Setting value stored to memory (Yes or No)
EXIT	Back to "Ready display"

Menu Commands **- ISO Insulation Resistance measurement**

U set	Test voltage set (100V…500V)
R min	Resistance low limit value (0,5MΩ… high limit value)
R max	Resistance high limit value (low limit value…9900MΩ or NU)
R rang	Resistance range (10MΩ, 100MΩ, 1000MΩ, 10000MΩ or AUTO)
NPLC	Integration time (2…250 (mains cycles))
Ramp	Voltage up ramp time (OFF or 0,1…9,9 seconds)
Timer	Test time clock (OFF or 0,3s…60s)
Save	Setting value stored to memory (Yes or No)
EXIT	Back to "Ready display"

Menu Commands - **HV High Voltage measurement**

U set	Voltage setting (0…5000V)
I rang	Current range (2mA or 10mA)
I min	Leakage current low limit value (0…high limit) or (0…high limit)
I max	Leakage current high limit value (low limit…1.99 or 9.9mA)
Spdet	Spark detector (OFF or 1…99), 1 equals highest sensitivity.
Ramp	Voltage will rise according to this setting. "0" means NO RAMP, absolute fastest ramp up and down time. Ramp time setting by user is omitted "1" means RAMP UP with a selected time, RAMP DOWN not selected the voltage is cut off immediately after test time has elapsed "2" means RAMP UP and RAMP DOWN times can be selected

AC/DC	Output voltage type (AC or DC) , DC option
Timer	Test time clock (OFF or 0,1s…60s)
Save	Setting values stored to memory (Yes or No)
EXIT	Back to "Ready display"

5.6.1 Selection of Current and Voltage Values in PE Measurement

The below table shows the recommended settings for various Ohmic ranges. If the test leads resistance is over 50mOhm it can limit the maximum measurable protective earth conductor resistance. In this case the user should switch to a lower measurement current and higher measurement voltage or replace the test leads with larger cross section leads.

Recommended current and voltage settings:

Measurement range	Test current I-set	Test voltage U-set
0…350mΩ	10A	6V
180…500mΩ	10A	12V
0…100mΩ	25A	6V
0…350mΩ	25A	12V

5.6.2 Use of timer

Timer stops testing automatically when the preset time has elapsed. It is possible to stop the test by pressing "stop"-button. In Timer off –mode test is ON when "Stop"-button is pressed (however max 120s).

5.6.3 Integration time (NPLC) in Insulation resistance test

Tester takes measurements and calculates resistance values. The integration time is basically the time during the FST takes samples. Units are NPLC, it means "number of power line cycles", and in example 100 means 2 seconds.

A higher value results in a higher measurement accuracy, but consequently the test time becomes longer.

5.6.4 Voltage Increase Time (Ramp) in Insulation Resistance Test

Different ramp times can set and if the Ramp is set then the voltage increase to the set value according to the set ramp time.

5.6.5 Spark detector (SPdet) in High Voltage Test

It is possible that during the dielectric withstand test some partial discharge caused sparks may occur. The FST-200 has special detector for this situation. Detector sensitivity must be checked and adjusted every time when test parameters or type of device under test and ambient conditions are changed. The sensitivity is higher with value 1 and lower at value 99.

The detector may cause a test fail if for instance a large capacitance is connected to the test circuit. This may occur especially with fast ramp up times in connection with capacitance.

5.6.6 Voltage increase method (Ramp) in High Voltage test

There are two different methods to impose the high voltage on the D.U.T.

Press the TEST On and start increasing output test voltage gradually by changing the set value of the voltage (Parameter setting mode).

In automatic ramp up and ramp down mode the voltage ramp up time and ramp down time is set in the parameter RAMP. Test time starts when voltage has reached the set value.

5.6.7 AC/DC Output in High Voltage Test (Option – Factory installed)

Standard FST-200 has an AC output voltage and optionally available DC output. The DC option has a full wave rectifier and 5nF filter capacitance. The equipment also has an automatic discharge resistor (4,5MΩ / 1,5W) if the DC option is used.

The user should be aware that if the D.U.T. capacitance and test voltage are very high voltage might still be on a dangerous level even the FST unit has been switched off.

5.7 Testing

The test voltage is switched on by pressing the “Start” -button. The recommended minimum measurement time is at least 1 second.

Test voltage is switched off by pressing “Stop” –button (if timer used, then according to timer setting)

After that the measurement can start again with the “Start”-button or return to “Ready” –display by pressing “Stop” –button.

5.7.1 Measuring in PE Continuity Test (PE)

Before the measurement the “Ready”-display and a few main parameters are shown.

PE: READY	LOCAL	Tester in local operation,
Timer OFF		timer is off
0-499mΩ/25A	low limit 0mΩ, high limit 499mΩ,test current 25A	

The measuring probes will be connected to the device under test (D.U.T.). The test voltage is switched on by pressing the “Start” –button or with PE Probe start button. The recommended measurement time is at least 1 second. The resistance and other information can be seen on display:

PE: TESTING	LOCAL
t=2.5s	(OFF)
I=26,8A	(25A)
R=102mΩ	(0-499)

Display updates itself constantly. Test voltage is switched off by pressing “Stop” –button (if there is no timer in use). Following results are shown on display:

PE TEST OK LOCAL	
t=4.5s	(OFF)
I=26,9A	(25A)
R=103mΩ	(0-499)

After that measurement can start again with "Start"-button or return to "Ready" –display by pressing "Stop" –button.

5.7.2 Measuring in Insulation Resistance Test (ISO)

Before the measurement the "Ready"-display and a few main parameters are shown.

ISO: READY LOCAL	Tester in local operation
Timer OFF	Timer is off
Ramp OFF	Ramp function off, low limit 0,5MΩ,
0,5-NU/10MΩ	High limit not used, Range 10MΩ, test
500V/50NPLC	Voltage 500V, integration time 50NPLC

The high voltage measuring probes will be connected to the D.U.T.. The test voltage is switched on by pressing the "Start" -button. The recommended measurement time is at least 1 second. The resistance value and other information can be seen on display:

TESTING	LOCAL
t=2.5s	(OFF)
U=501V	(500V)
R=2.0MΩ	(0.5MΩ)

Measurement stops by pressing "Stop"-button (if timer is off). Analog meter shows resistance value also after testing (if FST-200 not computer controlled). Display shows last measurements.

Example:

TEST OK	LOCAL
t=4.5s	(OFF)
U=501V	(500V)
R=2.0MΩ	(0.5MΩ)

After that measurement can start again with "Start" –button or return to "ready"-display by pressing "Stop"-button.

5.7.3 Measuring in High Voltage Test (HV)

Before the measurement the "Ready"-display and a few main parameters are shown.

HV: READY LOCAL	Tester in local operation,
Timer OFF	Timer is off,
0,00-1,99/2mA	low limit 0,00mA,high limit 1,99mA, range 2mA,
1000VAC † † †	test voltage 1000Vac, no ramp
Peak OFF	function, SPdet not used

The high voltage measuring probes will be connected to the device under test. The test voltage is switched on by pressing the "Start" -button. The recommended measurement time is at least 1 second. The resistance value and other information can be seen on display:

TESTING	LOCAL
T=2,5s	(OFF)
U=2308	(2300V)
I=18,5	(31,5mA)

Test voltage switched off by pressing "Stop" –button (if TIMER is OFF)

TEST OK	LOCAL
T=3,8s	(OFF)
U=2305	(2300V)
I=16,9	(31,5mA)

After that measurement can start again with "Start"-button or return to "Ready" –display by pressing "Stop" –button.

5.7.4 Resistance measuring (RES)

Before the measurement the "Ready"-display and a few main parameters are shown.

RES: READY LOCAL	Tester in local operation,
Timer OFF	Timer is off,
Min 0.00Ω Max 499Ω	Low limit 0.00Ω, high limit 499Ω,
R-range 500Ω	Measuring range 500 Ω

The measuring probes will be connected to the D.U.T. The test voltage is switched on by pressing the "Start" -button. The recommended measurement time is at least 1 second. The resistance value and other information can be seen on display:

RES:TESTING	LOCAL
T=2,5s	(OFF)
R=17.5	(0.00-499)
R-range 500Ω	

Test voltage switched off by pressing "Stop" –button (if TIMER is OFF)

RES:TEST OK	LOCAL
T=3,8s	(OFF)
R=17.4	(0.00-499)
R-range 500Ω	

After that measurement can start again with "Start"-button or return to "Ready" –display by pressing "Stop" –button.

5.7.5 Test sequence

Test sequence is controlled with "Start"-button. Every push on "START" commences a new test step. Measurement can be interrupted by pressing "STOP" if TIMER is off. If TIMER is on, measurement is stopped automatically. If PE Probe is used, it controls the PE test, however other measurements are commenced by pressing "Start"-button. All measurement parameters are set in the same manner as in chapter *5.4 Setting Parameters*. Measurement can be interrupted any time with "Stop"-button, then FST-200 shows an "interrupt" message.

If several measurements are conducted the FST-200 will show the last ones on the display, example:

TEST OK	LOCAL
PE 81mΩ	ISO 79,9M
HV 8,1mA	RES 50,0Ω
Result: Accepted	

New measurement is possible with PE Probe or "Start"-button.

6 ERROR MESSAGES

FST-200 gives an alarm if measurement values are not inside set limits.

Errors:
PE measuring

LOW CURRENT	Measuring current not set. Measuring circuit broken or high resistance

PE, ISO and RES measuring:

LOW RES	Resistance value lower than limit (R-min)
HIGH RES	Resistance value higher than limit (R-max)

ISO measuring

LOW VOLTAGE	Voltage does not go to set value. Maybe too short test time or high load in connections and at the same time low test voltage setting.

HV measuring

HIGH CURRENT	Leakage current higher than higher limit (I-max) Same text in lower row meaning out of measuring range
LOW CURRENT	Leakage current are lower than lower limit (I-min)
LOW VOLTAGE	Voltage does not reach the set value. Maybe too short test time or high load in connections and at the same time low test voltage setting.

OVERLOAD Current peak value alarm

PEAK CURRENT	Partial discharge detector alarm

General

+0.L	Over range (display in measuring value)
INTERRUPTED	Test is stopped by user.

SAFETY CIRCUIT OPEN Tester safety circuit is open.

All alarms can reset with “stop” button or start new measuring with “Start”-button.

7 OPERATION WITH COMPUTER

7.1 General

The FST-200 can be incorporated in an automatic test system providing automatic control and recording of the test results and other applications. Almost all operations are controlled by the computer or easier by using a Finero's specific proprietary application program Safetest. The command list for computer operation mode is appendix of this manual. The control interface, like USB, GPIB, RS232 or Ethernet, is optional and it must be ordered separately factory installed. All FST-line equipments are delivered standard with RS485 interface. By using this interface all FST-line equipments can communicate with each other.

7.2 Address Setting

The user must set the address for the FST-200 unit before starting the operation computer controlled. Address can be set in the range of 1...9.

Address is set as follows:

In the calibration information window please keep the "ENTER"-button pressed.

While the "ENTER" is pressed turn the flywheel knob as long as you have the desired address (AddX) and then release the "ENTER"-button . See picture on the lower right hand corner. Now the address has been selected and saved.

UNDER NO CIRCUMSTANCES THE USER IS NOT ALLOWED TO OPEN THE FST-200 ENCLOSURE. WARRANTY IS VOID IF OPENED!

7.3 Connections

The RS485 connection to other FST-200 must be done by a shielded Cat5 cable (STP) RJ45 (8 pin connector).

Other computer interfaces like USB, GPIB, RS232 and Ethernet, are connected with commercially available and compatible cables. The cables are not part of the delivery scope.

8 REMOTE CONTROL AND LOGIC OPERATION

8.1 General

This means a possibility to incorporate the FST-200 in less sophisticated automatic test systems. The FST-200 operates as in the manual mode but has a provision for extra output contacts for indicators and logic inputs for the control buttons.

8.2 Start-up

Basically the FST-200 will be put into operation as in manual mode. In addition the wiring of the operator connector at the back panel is to be done. The connector is a 25-pin D-type female connector. In the main circuit diagram connections of the D25 connector are explained. Maximum output from +25V is 300mA (7,5W).

8.3 Logic Connections

Contacts are available to show state of test and test result. Also there are two additional user programmable outputs.

“Test On” output is on, when voltage is on.

“Fail” output is on, when test current is higher than limit value. At the same time the test is interrupted.

The connector has logic inputs like the start and stop buttons. There are also two extra programmable inputs.

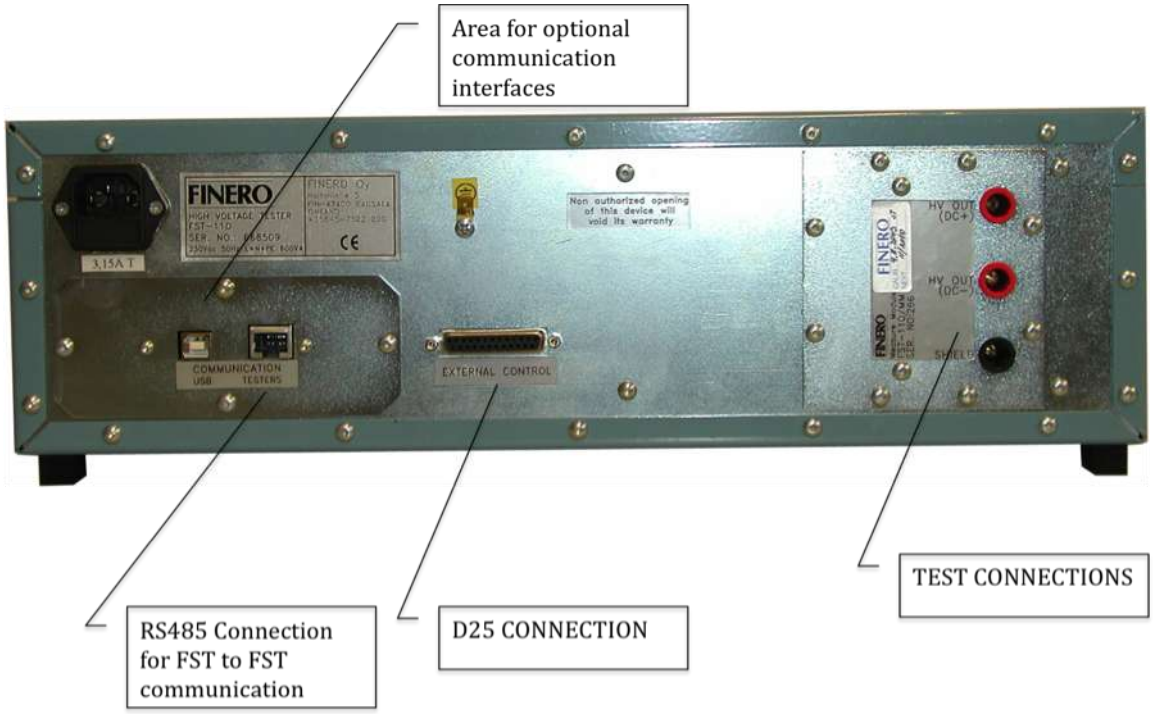
“Start” signal switches the test voltage on.

“Stop” signal disconnects the test voltage.

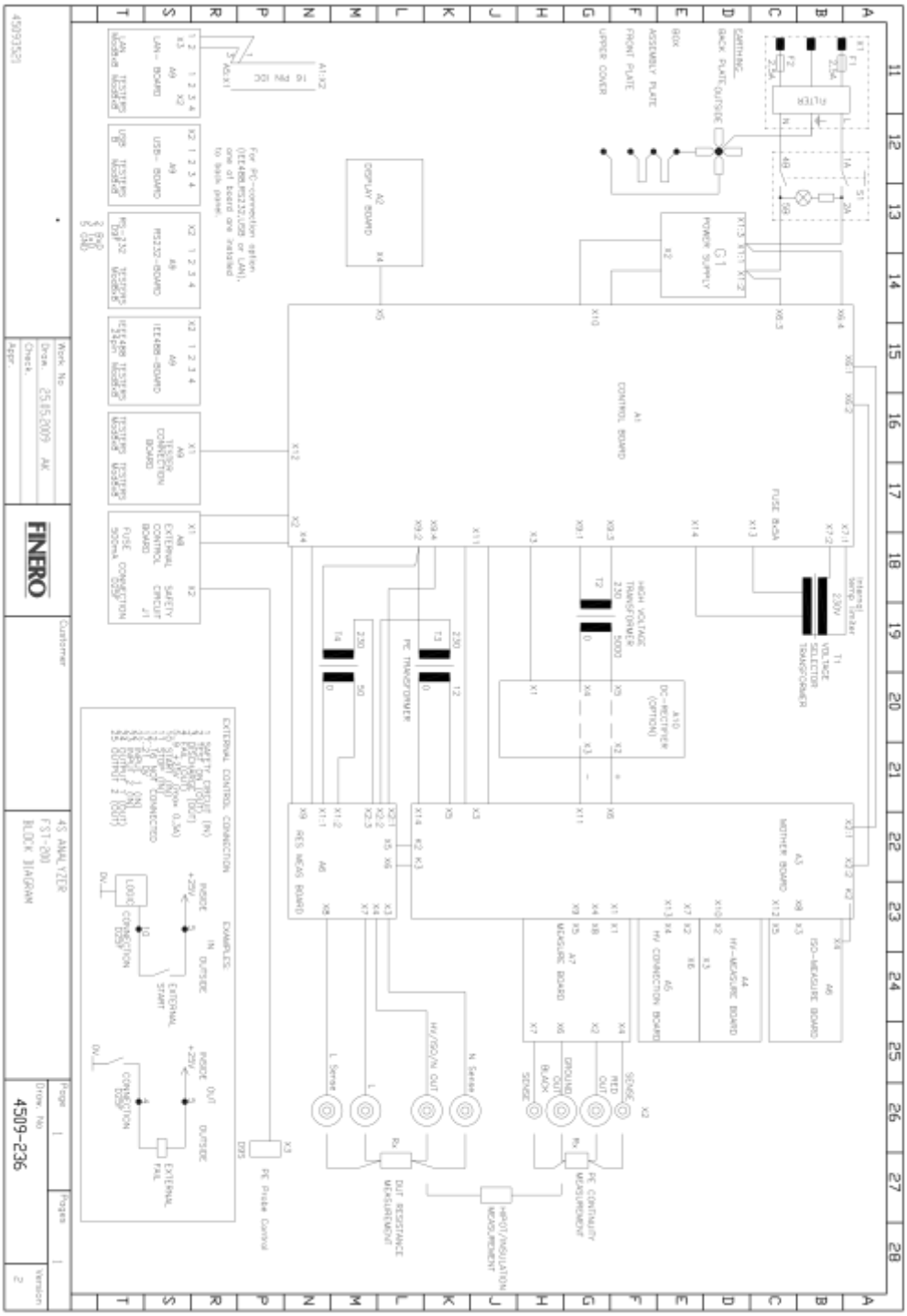
The connector has inputs for the safety circuit, if circuit is open high voltage is not connected. Please see the main circuit diagram for these connections.

9. BACK PANEL OF AN FST- LINE EQUIPMENT

The below picture shows a typical back panel of an FST-line product.



10. MAIN CIRCUIT DIAGRAM



11 FAULT FINDING

No indicator is lit	• Check the power cord connectors are properly plugged at both ends • Check the voltage in the mains socket. • Check the main fuses (F1 and F2) of the FST-200. The fuses are located in the fuse box below the power cord connector. Check the fuse by a multimeter for conductivity and replace with the similar one if necessary.
Indicators are lit but buttons don't function	• Check the safety circuit • Check set values in "Setting" menu.
FST-200 functions but high voltage is missing or voltage output is wrong	• Possibly the temperature switch inside the unit transformer has caused the equipment to stop • Wait for a moment and try again • If the occurs several times please contact Finero Service

If the above remedies do not remove the problem, please contact the Finero Service or Finero authorized service point.

Finero Service

For Service and Support please contact one of our representatives or

Tel. +358 5 752 2200
e-mail: fineroservice@qacontrol.com

12 LIMITED WARRANTY

All of our products and test systems are covered by a standard 12-month warranty period. The warranty period starts on the original shipment date of the product or test system. Our product and test system warranties guarantee that our products will be free from defects in material and workmanship and we will repair or replace any such Finero product or test system we find to be defective.

All new Finero products and test systems are calibrated prior to shipment. Finero products and test systems require annual calibration, if Finero has not given any other written instruction, and Finero accepts only calibrations made by an approved Finero partner or by Finero factory.

If your product during the 12-month warranty period fails to perform as Finero has specified please return the product to the below address or to one of our approved partners.

Warranty work includes parts and labour at Finero's cost, but excludes shipping costs. Finero products returned for warranty repair and found to be in proper working order may be subject to a shipping and handling fee.

Any non-authorized modification, repair, tampering or physical damage or if the product has been subject to gross misuse will void this warranty. Elimination of any connections in the earth grounding system or bypassing any safety systems will void this warranty. Parts subject to wear, such as test probes and leads, are not covered by this product warranty, except where they are deemed to have a manufacturing defect within 60 days of the original shipment of the Finero product.

Except as provided herein, Finero makes no warranties to the purchaser of Finero products and test systems and all other warranties, expressed or implied (including, without limitation, merchantability or fitness for a particular purpose) are hereby excluded, disclaimed and waived.

FINERO SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT CONSEQUENTIAL, INCIDENTAL OR OTHER SIMILAR DAMAGES SUFFERED BY THE PURCHASER OR ANY THIRD PARTY, INCLUDING WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS OR BUSINESS OR DAMAGES RESULTING FROM USE OR PERFORMANCE OF THE PRODUCT OR TEST SYSTEM, WHETHER IN CONTRACT OR IN TORT, EVEN IF FINERO OR ITS AUTHORIZED REPRESENTATIVE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, AND FINERO SHALL NOT BE LIABLE FOR ANY EXPENSES, CLAIMS, OR SUITS ARISING OUT OF OR RELATING TO ANY OF THE FOREGOING.

Due to continuous development of the products warranty does not include updating of features

When the warranty repair is booked the customer is requested to inform type and serial number of the equipment and description of the malfunction as detailed as possible. The repair shall be carried out in reasonable time during normal working hours. If immediate repair is demanded or done outside of normal working hours the extra costs may be born to the customer account. The warranty repair is done primarily at the manufactures premises.

Return address: Finero Oy, Service and Calibration, Haltonintie 5, FIN-47400 Kausala, FINLAND

ANNEX A

FST-200 4 S ANALYZER

COMMAND LIST

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NOTICE!

IF YOU HAVE ORDERED A COMPUTER INTERFACE WITH YOUR FST-EQUIPMENT THIS ANNEX IS RELEVANT FOR THE PROGRAMMING

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Summary of Tester Commands HV section:

HVT	Command related to FST-200/HV tester
AC	Voltage selection AC
DC	Voltage selection DC
VOLTage 1000	Test voltage setting 10..5000V
CURRent:RANGe 1	Leakage current range 1 = 2mA; 2 = 10 mA
CURRent:MAXimum 90	Leakage current setting, maximum 10..9990 (= 0.010..9.990 mA)
CURRent:MINimum 50	Leakage current setting, minimum 10..9990 (= 0.010..9.990 mA, 0 = off)
PEAK 0	Power surge limit, 0..100 % (0 = off, 100 = most insensitive)
TIMer 10	Test period in 1/10 seconds, 3..600 (0 = timer disabled)
RAMPtype 0	Test voltage rise/fall type
RLENgth 5	Test voltage rise/fall duration 5..30 sec
ON	Switches on test voltage, starts the test and lights up TEST indicator
OFF	Switches off test voltage, stops the test and turns off TEST indicator
RES?	Test results: Current, voltage, status, elapsed test time
CURR?	Measured leakage current?
VOLT?	Measured test voltage?
STAT?	Tester status?
TIM?	Elapsed test time and total time in 1/10 seconds, 0..1200
ADJ?	Tester adjustment date?
CAL?	Tester calibration date?

Tester commands and Examples how to use them

High Voltage, Hipot section:

HVT Indicates that the command applies to FST-200/Hipot tester part.

Example: HVT;VOLT 1000;ON

AC In case a rectifier unit is connected to the tester, selects AC voltage.

DC In case a rectifier unit is connected to the tester, selects DC voltage.

VOLTage mmm
mmm= voltage 10..5000V

Sets test voltage 10..5000V.

Examples:

VOLT 1000	Test voltage 1000V
VOLT 3200	Test voltage 3200V

CURRent:RANGe mmm
mmm= current range (1/2)

Selects leakage current range (2/10mA).

Examples:

CURR:RANG 1	Leakage current range 2mA
CURR:RANG 2	Leakage current range 10mA

CURRent:MAXimum mmm
mmm= Leakage current setting, maximum 10..9990 (= 0.010..9.990mA)

Specifies the leakage current maximum. When the limit is exceeded, the test stops, the tester gives out an alarm and status byte 1 bit 1 (test ended FAIL) and status byte 2 bit 0 (maximum) will be set.

Examples:

CURR:MAX 100	Leakage current maximum 0.100mA
CURR:MAX 1000	Leakage current maximum 1.000mA

CURRent:MINimum mmm
mmm= Leakage current setting, minimum 10..9990 (= 0.010..9.990mA)
0 = limit off.

Specifies the leakage current minimum. When the current is low, the test stops, the tester gives out an alarm and status byte 1 bit 1 (test ended FAIL) and status byte 2 bit 1 (minimum) will be set.

Examples:

CURR:MIN 0	Leakage current minimum control off
CURR:MIN 100	Leakage current minimum 0.100 mA
CURR:MIN 1000	Leakage current minimum 1.000 mA

PEAK mmm
mmm= Power surge limit, 0..100 % (0 = off, 100 = most insensitive)

Turns power surge indicator on or off.

TIMer mmm
mmm= Test period in 1/10 seconds, 3..600 (0 = timer disabled)

Enables or disables internal timer. When enabled, the test ends after the test period has expired (TEST indicator will turn off only by issuing OFF command) and status byte 1 bit 0 (test ended OK) will be set. Test begins by issuing a new ON command.

Example:

TIM 20	Test period 2 seconds

RAMPtype mmm
mmm= Test voltage rise/fall type:

0 = |¯| Voltage increases and decreases rapidly (NO Ramp!)

1 = /¯| Voltage increases slowly and decreases rapidly (Ramp UP, NO Ramp)

2 = /¯\ Voltage increases and decreases slowly (Ramp UP and DOWN)

RLENgth mmm
mmm= Test voltage rise/fall duration 5..30 sec

Example:

RAMP 1	Voltage increases slowly and decreases rapidly
RLEN 15	Voltage rise time is 15s

ON

Switches on test voltage, starts the test and lights up TEST indicator (equal to pressing START button in manual mode). Cancels the effect of ALAR:ON command. Resets flags of status bytes (see STAT?).

Example:

HVT;VOLT 500	
CURR:MAX 100	Leakage current maximum 0.100mA
ON	The test will start once the above settings have been specified.

OFF

Switches off test voltage, ends the test and turns off TEST indicator (equal to pressing STOP button in manual mode). If test was running (TIM was set), the device gives out alarm "Interrupted". If test was running (TIM not set), the device enters into the intermediate mode in which test results are shown on the display. Status byte 1 bit 0 (test ended OK) is set. If the device is in the intermediate mode already, it enters into the basic mode in which the settings are shown on the display. Resets flags of status bytes (see STAT?).

Example:

HVT;VOLT 500	
CURR:MAX 100	Leakage current maximum 0.100 mA
ON	Test starts... ...staying here for the specified time...
OFF	Test ends

RES? Test results; current, voltage, status byte 1, elapsed test time

Test output query, provides 4 figures: aa bb cc dd

aa	Measured leakage current 0..10 000 (= 0..10.000mA). Range exceeded = 10999, -1 = no measuring data.
bb	Test voltage measured during test in volts 0..5000.
cc	Status byte 1 (see STAT?)
dd	Elapsed test period in 1/10 seconds (0..600)

Example:

HVT; VOLT 500	
CURR:RANG 1	
CURR:MAX 1000	
ON	Test starts ...
RES?	Testing, for example, at 0.1s intervals until the specified test time is out.
OFF	Test ends

CURR? Sampling leakage current, output will be the measured current 0..10 000 (= 0..10.000mA). Range exceeded = 10999, -1 = no measuring data.

Example:

HVT; VOLT 500	
CURR:RANG 1	
CURR:MAX 1000	
ON	Test starts ...
CURR?	Testing leakage current

VOLT? Sampling test voltage, output will be the measured voltage in volts (0..5000).

Example:

HVT; VOLT 500

```
CURR:RANG 1
CURR:MAX 1000
ON                  Test starts ...
VOLT?               Sampling test voltage
```

STAT? Returns output involving 2 status bytes, at the same time resets some related bits: mmm nnn

mmm status byte 1:

bit	value	meaning	Reset
0	1	Test ended OK	ON/OFF
1	2	Test ended FAIL	ON/OFF
2	4	Tester not in remote mode	
3	8	Safety circuit open	
4	16	Communication error	STAT?
5	32	Tester failure	STAT?

nnn status byte 2:

0	1	Set control limit exceeded	ON/OFF
1	2	Set control limit not reached	ON/OFF
2	4	Test voltage not reached (low voltage)	ON/OFF
3	8	Breakdown	ON/OFF
4	16	Communication error MM - Controller	STAT?
5	32	Communication error RS - Controller	STAT?
6	64	Communication error DNN - Controller	STAT?
7	128	Communication error PC-RS	STAT?

If the mmm bit 5 is set, the tester output will be unreliable. Moreover, if the mmm bit 1 is set, current measuring range 2 should be used.

Example:

```
HVT; VOLT 500
CURR:RANG 1
CURR:MAX 1000
ON                  Test starts ...
```

STAT? Testing, for example, at 0.1 sec intervals, until the specified test time is out (status byte 1 bit 0 or 1 is set). If status byte 1 value is 1, the test was performed without errors. If bit 1 is set, the tester gave and alarm the cause of which is indicated by status byte 2.

RES? Sampling test output

TIM? Sampling test time, provides 2 figures: aa bb

aa Elapsed test period in 1/10 seconds (0.0.1200)
bb Specified test period in 1/10 seconds (3..1200)

ADJ? Tester adjustment date query, output will be the following string: dd.mm.yyyy

For example: 27.08.2001

CAL? Tester calibration date query, output will be the following string: dd.mm.yyyy

For example: 27.08.2001

Commands for the insulation resistance section, summary:

ISO	Command involves FST-200/ISO tester
VOLTage 500	Test voltage 100..500V
RESistance:RANGe 1	Insulation resistance range 1..5 (=10/100/1000/10 000/Auto MΩ)
RESistance:MAXimum 900	Insulation resistance limit 0.5..10 000 MΩ (10 0000 = limit disabled)
RESistance:MINimum 0.5	Insulation resistance limit 0.5..10 000 MΩ
NPLC 100	Integration time in mains voltage periods 2..250.
TIMer 10	Test period in 1/10 seconds, 3..600 (0 = timer disabled)
RLENgth 10	Test voltage rise time in 1/10 seconds, 0..100
ON	Start the test
OFF	Stop the test
RES?	Test output; insulation resistance, voltage, status, elapsed test time
VOLT?	Measured test voltage?
STAT?	Tester status?
TIM?	Elapsed test time and total time in 1/10 seconds, 0..1200
ADJ?	Tester adjustment date?
CAL?	Tester calibration date?

Commands for the insulation resistance test section, detailed:

ISO Indicates that the command relates to the FST-200/ISO tester.

Example:

ISO;VOLT 500

VOLTage m Sets the test voltage (100..1000V).
m =Voltage (100..1000V)

Examples:

VOLT 500	Test voltage 500V
VOLT 1000	Test voltage 1000V

RESistance:RANGe m
m =Resistance range 1..5 (=10/100/1000/10 000/Auto MΩ)

Selects the resistance range 1..5 (=10/100/1000/10000/Auto MΩ). In range 5 (Auto) the tester automatically selects the most appropriate measurement range.

Examples:

RES:RANG 1	Resistance range 0.5MΩ .. 10MΩ
RES:RANG 2	Resistance range 5MΩ .. 100MΩ
RES:RANG 5	Automatic range selection 0.5MΩ .. 10,000MΩ

RESistance:MAXimum mmm
mmm =Resistance limit 0.5..10,000 MΩ (10,000 = limit disabled)

Sets the insulation resistance maximum. Only 1 digit is allowed after the decimal point (or comma). Once the resistance limit is exceeded, the test stops, tester gives out an alarm and status byte 1 bit 1 (test ended FAIL) and status byte 2 bit 1 (maximum) is set. Maximum limit is disabled by specifying the value 10,000.

Examples:

RES:RANG 1;RES:MAX 1	Insulation resistance limit 1 MΩ
RES:RANG 2;RES:MAX 1000	Insulation resistance limit 1000 MΩ

RESistance:MINimum mmm
mmm =Resistance limit 0.5..10 000 MΩ

Sets the insulation resistance minimum. Only 1 digit is allowed after the decimal point (or comma). When the resistance limit is not reached, the test stops, the tester gives out an alarm and status byte 1 bit 1 (test ended FAIL) and status byte 2 bit 0 (minimum) will be set.

Examples:

RES:RANG 1;RES:MIN 0.5	Insulation resistance limit 0.5 MΩ
RES:RANG 2;RES:MIN 10	Insulation resistance limit 10 MΩ

NPLC mmm
mmm =Integration time in mains voltage periods 2..250.

Integration time is the period during which the tester's A/D converter samples the test voltage to provide the test result. The value is increased when greater measurement accuracy is desired and decreased for greater measurement speed.

Example:

NPLC 100	Integration time is 100 mains periods (100 x 20ms = 2000ms)

TIMer mmm
mmm =Test period in 1/10 seconds, 3..600 (0 = timer disabled)

Enables or disables internal timer. When enabled, the test ends after the test time has expired (TEST indicator will turn off only by issuing OFF command) and status byte 1 bit 0 (test ended OK) is set. Test begins by issuing a new ON command.

Example:

TIM 20	Test period 2 seconds

RLENgth mmm
mmm =Test voltage rise time in 1/10 seconds, 0..100

Example:

RLEN 15	The voltage rise time is 1.5 sec

ON

Switches on test voltage, starts the test and lights up the TEST indicator (equal to pressing START button in manual mode). Cancels the effect of ALAR:ON command. Resets flags of status bytes (see STAT?).

Example:

ISO;VOLT 500
RES:RANG 1;RES:MIN 0.6

ON	The test will start once the above settings have been specified.

OFF

Switches off test voltage, ends the test and turns off TEST indicator (equal to pressing STOP button in manual mode). If test was running (TIM was set), the device gives out alarm "Interrupted". If test was running (TIM not set), the device enters intermediate mode in which test results are shown on the display. Status byte 1 bit 0 (test ended OK) is set. If the device is already in the intermediate mode, it enters into the basic mode in which the settings are shown on the display. Resets flags of status bytes (see STAT?).

Example:

ISO;VOLT 500
RES:RANG 1;RES:MIN 1

ON	Test starts... ...staying here for the specified time...
OFF	Test ends

RES?

Test output; resistance, voltage, status byte 1, elapsed test time

Test output query, provides 4 figures: aa bb cc dd

aa	Measured insulation resistance (0.5..10 200 MΩ, low range 0.4 exceeded 10201 -1 = no measuring output).
bb	Test voltage measured during the test 0..1009 V, -1 = no measuring output.
cc	Status byte 1 (see STAT?)

dd	Elapsed test period in 1/10 seconds (0..600)

Example:

ISO; VOLT 500	
RES:RANG 2;RES:MIN 1	
ON	Test starts ...
RES?	Sampling, for example, at 0.1s intervals until the specified test time is out.
OFF	Test ends

VOLT? Sampling test voltage, the provided output will be the measured voltage in volts (0..1009 V, 9999 = integration in progress).

Example:

ISO;VOLT 500	
RES:RANG 2;RES:MIN 1	
ON	Test starts ...
VOLT?	Sampling the test voltage

STAT? Returns output involving 2 status bytes, at the same time resets some related bits: mmm nnn

mmm status byte 1:

bit	value	meaning	Reset
0	1	Test ended OK	ON/OFF
1	2	Test ended FAIL	ON/OFF
2	4	Tester not in remote mode	
3	8	Safety circuit open	
4	16	Communication error	STAT?
5	32	Tester failure	STAT?

nnn status byte 2:

0	1	Set control limit not reached	ON/OFF
1	2	Set control limit exceeded	ON/OFF
2	4	Test voltage not reached (low voltage)	ON/OFF

3	8	-	
4	16	Communication error MM-Controller	STAT?
5	32	Communication error RS-Controller	STAT?
6	64	Communication error DNN- Controller	STAT?
7	128	Communication error PC-RS	STAT?

Example:

ISO;VOLT 500	
RES:RANG 2;RES:MIN 1	
TIM 10	
ON	Test starts ...
STAT?	Testing, for example, at 0.1 sec intervals, until the specified test time is out (status byte 1 bit 0 or 1 is set). If status byte 1 value is 1, the test was performed without errors. If bit 1 is set, the tester gave the alarm the cause of which is indicated by status byte 2.
RES?	Sampling the insulation resistance value

TIM? Sampling the test time, provides 2 figures: aa bb

aa	Elapsed test time in 1/10 seconds (0.0.1200)
bb	Specified test time in 1/10 seconds (3..1200)

ADJ? Tester adjustment date query, the provided output will be the following string: dd.mm.yyyy

For example: 27.08.2001

CAL? Tester calibration date query, output will be the following string: dd.mm.yyyy

For example: 27.08.2001

Commands for the earthing resistance section, summary:

PCT	Command related to FST-200/PE tester
CURRent 25	Selection of test current 10/25A
RESistance:MAXimum 90	Earthing circuit resistance, maximum 0..499mΩ
RESistance:MINimum 50	Earthing circuit resistance, minimum 0..498mΩ
TIMer 10	Test period in 1/10 seconds, 3..600 (0 = timer disabled)
ON	Switches on the test current and starts the test
OFF	Turns off the test current and stops the test
SREL 8	Current regulation relay setting, initial value is 8 (0..255)
RES?	Test output; resistance, current, status byte 1, elapsed test time
CURR?	Measured test current?
STAT?	Tester status?
TIM?	Elapsed test time and total time in 1/10 seconds, 0..1200
REL?	Current regulation relay setting?
ADJ?	Tester adjustment date?
CAL?	Tester calibration date?

Commands for the earthing resistance test section, detailed:

PCT Indicates that the command relates to the FST-200/PE tester.

Example:

PCT;CURR 10;ON

CURRent m Selects the test current (10/25A).
m =current (10/25)

Examples:

CURR 10	Test current 10A
CURR 25	Test current 25A

RESistance:MAXimum mmm
mmm =Resistance limit (0..499mΩ)

Specifies the earthing circuit resistance maximum. Once the resistance limit is exceeded, the test stops, the tester gives out an alarm and status byte 1 bit 1 (test ended FAIL) and status byte 2 bit 0 (maximum) will be set.

Examples:

RES:MAX 150	Resistance limit 150mΩ
RES:MAX 400	Resistance limit 400mΩ

RESistance:MINimum mmm
mmm =Resistance limit (0..498mΩ)

Specifies the earthing circuit resistance minimum. When the resistance limit is not reached, the test stops, the tester gives out an alarm and status byte 1 bit 1 (test ended FAIL) and status byte 2 bit 1 (minimum) will be set.

Examples:

RES:MIN 150	Resistance limit 150mΩ
RES:MIN 400	Resistance limit 400mΩ

TIMer mmm
Mmm =Test period in 1/10 seconds, 3..600 (0 = timer disabled)

Enables or disables internal timer. When enabled, the test ends after the test period has expired (TEST indicator will turn off only by issuing OFF command) and status byte 1 bit 0 (test ended OK) will be set. Test begins by issuing a new ON command.

ON

Switches on the test voltage, starts the test and lights up the TEST indicator (equal to pressing START button in manual mode). Cancels the effect of ALAR:ON command. Resets flags of status bytes (see STAT?).

Example:

PCT;CURR 10;RES:MAX 300

ON	The test will start once the above settings have been specified.

OFF

Switches off test voltage, ends the test and turns off TEST indicator (equal to pressing STOP button in manual mode). If test was running (TIM was set), the device gives out alarm "Interrupted". If test was running (TIM not set), the device enters intermediate mode in which test results are shown on the display. Status byte 1 bit 0 (test ended OK) is set. If the device is already in the intermediate mode, it enters into the basic mode in which the settings are shown on the display. Resets flags of status bytes (see STAT?).

Example:

PCT;CURR 10;RES:MAX 300

ON	Test starts... ...staying here for the specified time...
OFF	Test ends

SREL mmm

mmm =Current regulation relay setting, initial value (0..255)

Specifies the current regulation relay setting initial value (see command REL?). In the beginning of the test the current regulation will start from this position. The command will be effective for one test only. Using the command is not mandatory. If the command is not used, the regulation begins from position 8.

RES?

Test output; resistance, current, status byte 1, elapsed test time

Test result query, provides 4 figures: aa bb cc dd

aa	Measured earthing circuit resistance (0..500 mohm, 501 = range exceeded, 16383 = sampling in progress).
bb	The current measured during test in 1/10 amperes (0..295).
cc	Status byte 1 (see STAT?)
dd	Elapsed test time in 1/10 seconds (0..600)

Example:

PCT;TIM 10;CURR 10;RES:MAX 450

ON	Test starts ...
RES?	Sampling, for example, at 0.1s intervals until the specified test time is out.

CURR? Test current query, the provided output will be the measured current in 1/10 amperes (0..295).

Example:

PCT;CURR 10;RES:MAX 450

ON	Test starts ...
CURR?	Sampling the test current

STAT? Returns output involving 2 status bytes, at the same time resets some related bits: mmm nnn

mmm status byte 1:

bit	value	meaning	Reset
0	1	Test ended OK	ON/OFF
1	2	Test ended FAIL	ON/OFF
2	4	Tester not in remote mode	
3	8	-	
4	16	Communication error	STAT?
5	32	Tester failure	STAT?

	nnn	status byte 2:	
0	1	Set control limit exceeded	ON/OFF
1	2	Set control limit not reached	ON/OFF
2	4	Test current not reached (low current)	ON/OFF
3	8	-	
4	16	Communication error MM-Controller	STAT?
5	32	Communication error RS-Controller	STAT?
6	64	Communication error DNN-Controller	STAT?
7	128	Communication error PC-RS	STAT?

Example:

PCT;CURR 10;RES:MAX 300;TIM 10

ON	Test starts ...
STAT?	Testing, for example, at 0.1 sec intervals, until the specified test time is out (status byte 1 bit 0 or 1 is set). If status byte 1 value is 1, the test was performed without errors. If bit 1 is set, the tester gave the alarm the cause of which is indicated by status byte 2.
RES?	Sampling the earthing resistance

TIM? Sampling the test time, provides 2 figures: aa bb

aa	Elapsed test time in 1/10 seconds (0.0.1200)
bb	Specified test time in 1/10 seconds (3..1200)

REL? Sampling the current regulation relay setting, the output will be figure (0..255). This command is used together with the SREL command so that after the test the REL? command polls the relay position used in the test. When a similar test will be performed, the probable relay position will be indicated to the tester by issuing the SREL command. As a result, the current regulation will be faster and the relays last longer.

Example:

...	Test events
OFF	Test ends
REL?	The relay position is polled, the output will be, for example, 11
...	Test events
SREL 11	Indicating the probable relay position to the tester
ON	Starting the test
...	Test events

ADJ? Tester adjustment date query, the provided output will be the following string: dd.mm.yyyy

For example: 27.08.2001

CAL? Tester calibration date query, output will be the following string: dd.mm.yyyy

For example: 27.08.2001

Commands for the resistance measurement section, summary:

RESI	Command related to FST-200/RESI tester
RESistance:RANGe 1	Resistance measurement range 1..5 (=2/10/100/500/Auto Ω)
RESistance:MAXimum 90	Measured resistance, maximum 0..49900 (= 0..499.00 Ω)
RESistance:MINimum 50	Measured resistance, minimum 0.0.49800 (= 0..498.00Ω)
TIMer 10	Test period in 1/10 seconds, 3..600 (0 = timer disabled)
ON	Switches on the test current and starts the test
OFF	Turns off the test current and stops the test
RES?	Test output; resistance, status byte 1, elapsed test time
STAT?	Tester status?
TIM?	Elapsed test time and total time in 1/10 seconds, 0..1200
ADJ?	Tester adjustment date?
CAL?	Tester calibration date?

Commands for the resistance measurement section, detailed:

RESI Indicates that the command relates to the FST-200/RESI tester.

Example:

RESI;TIM 10;ON

RESistance:RANGe m
m =resistance range 1..5 (=2/10/100/500/Auto Ω)

Selects the resistance range (2/10/100/500/Auto Ω). In range 5 (Auto) the tester will automatically select the most appropriate measurement range.

Examples:

RESI:RANG 1	Resistance range 0 .. 2Ω
RESI:RANG 2	Resistance range 0 .. 10Ω

RESI:RANG 5 Automatic range selection 2Ω .. 500Ω

RESistance:MAXimum mmm
mmm =Resistance limit 0..49900 (= 0..499.00 Ω)

Specifies the measured resistance maximum. Once the specified resistance limit is exceeded, the test stops, the tester gives out an alarm and status byte 1 bit 1 (test ended FAIL) and status byte 2 bit 0 (maximum) will be set.

Examples:

RESI:MAX 150 Resistance limit 1.50Ω
RESI:MAX 400 Resistance limit 4.00Ω

RESistance:MINimum mmm
mmm =Resistance limit 0..49800 (= 0..498.00Ω)

Specifies the measured resistance minimum. When the resistance limit is not reached, the test stops, the tester gives out an alarm and status byte 1 bit 1 (test ended FAIL) and status byte 2 bit 1 (minimum) will be set.

Examples:

RESI:MIN 150 Resistance limit 1.50.00Ω
RESI:MIN 400 Resistance limit 4.00Ω

TIMer mmm
mmm =Test period in 1/10 seconds, 3..600 (0 = timer disabled)

Enables or disables internal timer. When enabled, the test ends after the test period has expired (TEST indicator will turn off only by issuing OFF command) and status byte 1 bit 0 (test ended OK) will be set. Test begins by issuing a new ON command. Example:

ON

Switches on the test voltage, starts the test and lights up the TEST indicator (equal to pressing START button in manual mode). Cancels the effect of ALAR:ON command. Resets flags of status bytes (see STAT?).

Example:

RESI;RES:MAX 300

ON	The test will start once the above settings have been specified.

OFF

Switches off test voltage, ends the test and turns off the TEST indicator (equal to pressing STOP button in manual mode). If test was running (TIM was set), the device gives out alarm "Interrupted". If test was running (TIM not set), the device enters intermediate mode in which test results are shown on the display. Status byte 1 bit 0 (test ended OK) will be set. If the device is already in the intermediate mode, it enters into the basic mode in which the settings are shown on the display. Resets flags of status bytes (see STAT?).

Example:

RESI; RES:MAX 300

ON	Test starts... ...staying here for the specified time ...
OFF	Test ends

RES?

Test output; resistance, status byte 1, elapsed test time

Test result query, provides 3 figures: aa bb cc

aa	Measured resistance 0..50100 (= 0..501.00Ω) 50101 = range exceeded, -1 = no measuring output).
bb	Status byte 1 (see STAT?)
cc	Elapsed test time in 1/10 seconds (0..600)

Example:

RESI;TIM 10; RES:MAX 450

ON	Test starts ...

RES?	Sampling, for example, at 0.1s intervals until the specified test time is out.

STAT? Returns output involving 2 status bytes, at the same time resets some related bits: mmm nnn

mmm status byte 1:

bit	value	meaning	Reset
0	1	Test ended OK	ON/OFF
1	2	Test ended FAIL	ON/OFF
2	4	Tester not in remote mode	
3	8	-	
4	16	Communication error	STAT?
5	32	Tester failure	STAT?

nnn status byte 2:

bit	value	meaning	Reset
0	1	Set control limit exceeded	ON/OFF
1	2	Set control limit not reached	ON/OFF
2	4	-	
3	8	-	
4	16	-	STAT?
5	32	Communication error RS-Controller	STAT?
6	64	Communication error DNN-Controller	STAT?
7	128	Communication error PC-RS	STAT?

Example:

RESI;RES:MAX 300;TIM 10

ON	Test starts ...
STAT?	Testing, for example, at 0.1 sec intervals, until the specified test time is out (status byte 1 bit 0 or 1 is set). If status byte 1 value is 1, the test was performed without errors. If bit 1 is set, the tester gave the alarm the cause of which is indicated by status byte 2.
RES?	Querying the measured resistance

TIM? Test time query, provides 2 figures: aa bb

aa	Elapsed test time in 1/10 seconds (0.0.1200)
bb	Specified test time in 1/10 seconds (3..1200)

ADJ? Tester adjustment date query, the provided output will be the following string: dd.mm.yyyy

For example: 27.08.2001

CAL? Tester calibration date query, output will be the following string: dd.mm.yyyy

For example: 27.08.2001

Shared commands for the entire tester, summary:

HVT	Command related to FST-200/HV tester or
PCT	Command related to FST-200/PE tester or
ISO	Command related to FST-200/ISO tester
RESI	Command related to FST-200/RESI tester
ALARm:ON	Alarm
ALARm:OFF	Alarm off
OUT1:ON	Output 1 setting
OUT2:OFF	Output 2 off
IDN ""	A tester-specific identifier will be set, maximum 20 characters
OUT?	Status of outputs 1,2?
IN?	Status of inputs 1,2?
VER?	Tester version?
IDN?	A tester-specific identifier will be read, maximum 20 characters

Shared commands for the entire tester, detailed:

ALARm:ON The tester FAIL indicator lights up and the buzzer sounds for 1 second. Stops the test like the OFF command.

Example: ALAR:ON

ALARm:OFF The tester FAIL indicator goes out.

Example: ALAR:OFF

OUT1:ON Setting of output 1

Activates the tester EXTERNAL CONTROL terminal output 1.

OUT2:ON Setting of output 2

Activates the tester EXTERNAL CONTROL terminal output 2.

OUT1:OFF Output 1 off

Resets the tester EXTERNAL CONTROL terminal output 1.

OUT2:OFF Output 2 off

Resets the tester EXTERNAL CONTROL terminal output 2.

IDN ” ” A tester-specific identifier will be set, maximum 20 characters

Specifies a free-form identifier, which may not include quotes.

Example: IDN ” FST-200 s:no 12345”

OUT? Query of output statuses, the provided data will be 2 figures: aa bb

aa	Output OUT1 status (1 = active)
bb	Output OUT2 status (1 = active)

IN? Query of input statuses, the provided data will be 2 figures: aa bb

aa	Input IN1 status (1 = active)
bb	Input IN2 status (1 = active)

VER? Queries the tester build version data, provides a string listing the tester's interface cards' version numbers/software version numbers.

Example:

HVT;VER?
Provided data:

RS-4122v1/v1.1 MM-4184v1/v1.0 HV-4213v0/v1.0 DNN-4074v4/v2.0

IDN?

Querying the tester-specific identifier. The provided data will be the specified free-form identifier stored in the tester, maximum 20 characters. Identifier specified by Finero includes the tester type and the serial number.

Example: FST-200 sno: 556101